Midwest Engineer

SERVING THE ENGINEERING PROFESSION

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DISTRIBUTION OF FLOWS IN A NETWORK, PART I—PAGE THREE

WSE MEETINGS—PAGE TWO

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Serving the Engineering Profession

APRIL, 1955 Vol. 7, No. 11

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COVER STORY

A 620 ton steel jigsaw puzzle is put together and "match marked" by U. S. Steel Corporation's American Bridge Division (Gary, Ind.) workmen prior to shipment to the Mackinac Bridge construction site in the upper Michigan peninsula.

This huge portal section, 74 ft. wide and 103 ft. long, will be a brace for one of the two main cable-supporting towers. Eventually the upper half, known as the "K" section, will support part of the bridge roadway.

The Mackinac Bridge, started in 1954, will be completed in 1957, according to the Mackinac Bridge Authority.

—U. S. Steel Photo

this month at WSE

COMING EVENTS OF INTEREST TO ALL MEMBERS

May 11, Noon Luncheon Meeting

Speaker: Kenneth E. Reed, engineering consultant and accounting executive, Marsh & McLennan, Inc.

Subject: "Aircraft Liability Insurance." Whether you, your company, or a friend own an airplane, or whether you just plan to take a plane ride sometime in the future, you will find this talk of interest. It will be a brief run-down of coverages available for accidents involving private and commercial aircraft. It will also include a discussion of liability problems of importance to owners of airplanes.

May 16, WSE General Program

Speaker: Jack E. Fleming, district engineer, Link-Belt Speeder Corp., Cedar Rapids.

Subject: "Back of the Boom." This is in reference to a new shovel-crane. The talk will disclose how the machine was developed, including such interesting aspects as designing, testing, and manufacturing. The economics involved will also be touched on. A sound color-film will amplify the subject.

May 18, Noon Luncheon Meeting

Speaker: J. D. Cannady, hobby-astronomer.

Subject: "Facts and Conjectures about the Planet Mars." Have you chanced to think of going to the planet Mars lately? Well, a great many people have, and, many of them confess, it's an absorbing subject. Maybe you will find it so. Why not come to this meeting and find out.

May 24, Communications Section Meeting

Speaker: Leonard L. Ruggles, chief telephone engineer, Automatic Electric Co.

Subject: "Observations on Telecommunications in Europe." Ruggles toured Europe as a member of a technical team which visited many telephone companies and telephone equipment manufacturers. He will discuss the types of equipment used in the various countries; also new developments, including electronic switching. Everyone is invited.

June 7, Annual Meeting and Dinner

Be sure to reserve this date. You will receive full information later.

Methods of Determining the

Distribution of Flows in a Network

Part 1

By K. J. Stanton, MWSE

The purpose of this paper is to present various methods of determining the distribution of flows in a network with which the author has at least some familiarity. None of the methods have been originated by the author, although he has had some part in developing the method of solution on a digital computer.

The term network as used in this paper means a group of more than one conduits interconnected so that they are interrelated as to flow and pressure conditions. The conduits may be pipes of various materials in the case of such fluids as water, sewage, or gas, or wires in the case of electricity. Let us assume that for the networks with which we shall deal we have accurate maps which truly represent the network, both as to length and size of conduit. Further, let us assume that the various supply points, the various points from which loads will be supplied from the network, and the determination of the loads themselves have all been made, as the method of determining these things is a special field, different within each utility.

With any of the fluids, the pressure drop within any pipe section will be determined by the formula $H=KQ^X$, where H is the loss in pressure, K is a constant depending upon the fluid flowing, the size and length of pipe, units used, and other factors, and Q is the quantity flowing. The exponent of Q, i.e., "x" will vary with different fluids (or analogous substances such as electricity) being 1 for direct current electricity, commonly 2 for gas, etc. Given a network with certain supply points and with definite loads supplied from the network, natural laws will determine the flows within each pipe section. One of the laws is that the algebraic sum of loads to and from any point in the system must be equal to Zero. If this were not true, the fluid would not be continuous and this would be contrary to common sense. Since the system is assumed to be tight, the amount of fluid delivered into the system must be equal to the amount of fluid removed from the system. Further, if all the supply points are operating with the same pressure, then the algebraic sum of the pressure drops from any point in the system to any point of supply, by whatever route, must be the same; all of this, of course, when a stable flowing condition has been established.

The determination of the flows within the various pipe sections in a network is not an academic one, but is a problem faced every day by engineers in various utilities in determining if the system has the capacity to supply a proposed load, or if not, in determining the most economical method of improving the network so that the load may be supplied.

When conditions will permit, it may be that the best way to solve the problem will be to impose the various loads upon the system and actually determine what conditions exist. In most instances, this will be impracticable, and it will be necessary to determine in some way the quantity of fluid flowing in each pipe section and then verify mathematically. One could assign flowing loads at random and eventually, depending on how lucky one was, strike the correct situation. But in a network of any size, this would be an almost endless task and one that is not attractive to an engineer. There are more practical ways of solving the problem, among them being the cut-and-try manual methods, the Hardy Cross method, the use of analog devices, and solution by means of a digital computer. These will be discussed in detail in turns.

To be sure that the problem is understood, it is illustrated in figure 1. Here we have a network of seven interconnected pipe sections numbered 1 to 7. The point of supply is indicated at A and, for the purposes of this problem, is considered to be an unlimited supply at a selected delivery pressure. At points B and C are indicated loads that are supplied by the network. Alongside of each pipe section is a number which represents the resistance factor of that pipe section. This resistance factor takes

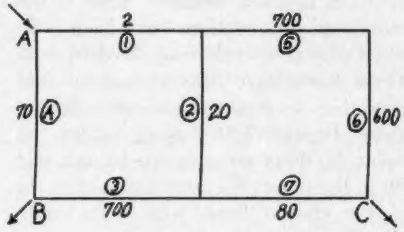


Figure 1

into account the length of the section, the size of the conduit, qualities of the flowing fluid, etc., so that when it is multiplied by Q^X, the proper loss of head or pressure in that pipe section will be determined. At first glance, these factors may appear to have an unusually large range, being from 2 to 700, but in fact are quite representative of the gas networks at least. The problem then is to determine the flows in the various pipe sections so that the following conditions will be met: 1. That the algebraic sum of the flow to and from each point is equal to zero. 2. That the algebraic sum of the pressure drops from any point in the network to any point of supply, by whatever route, be equal. Condition 1 may be easily met when assigning the tentative flows to the various pipe sections. The validity of the flows is then tested by determining the pressure loss in each section and checking that condition number 2 is satisfied. For example:

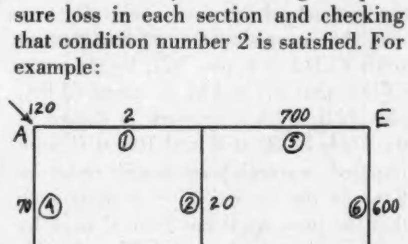


Figure 2

Mr. Stanton, who prepared this paper, is an assistant gas engineer with the Northern Illinois Gas Company.

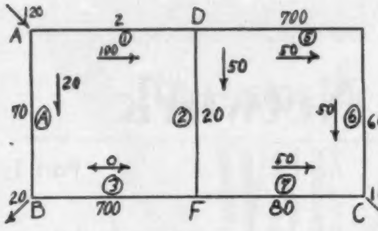
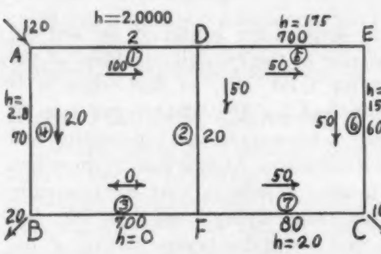


Figure 3

In figure 2 we have indicated that there is a load of 20 at B and 100 at C. Of necessity then, 120 must be supplied at A. In figure 3, assumed flows in the individual pipe sections have been indicated with arrows showing the direction. These flows have been chosen so that condition 1 is met. For example, at Point D with 100 flowing up to the point, 50 flows away in one branch and 50 in the other. We must now test to see if the chosen flows will meet condition 2.



Pressure Drops		
	CEDA:	+327
	CFDA:	+ 27
	CFBA:	+ 22.8

Figure 4

In figure 4, we have shown the pressure drop in each pipe section calculated on the basis that $K=10^{-4}$, and the exponent of Q is 2. To determine the sign of the pressure drop, let us use the convention that the drop will be negative in the direction of flow and positive in the direction opposite to flow. Checking the pressure drops from point C to A over the various routes, we find that by route CEDA it is plus 327, by the route CFDA, plus 27, and by the route CFBA, plus 22.8. With a network as shown, if the loads of 20 at B and 100 at C were imposed, natural laws would result in flows in the various pipe sections such that the pressure drops from C to A by any route would be equal. Thus in this example, we have not chosen the proper flows.

Of the cut-and-try manual methods, there are two logical ways of approaching the designation of the flowing loads. The first is to total the load within the system and then assign a portion of the load to be supplied by each of the supply points. From the supply point, one must then choose the amounts to go by each of the routes available from the supply point. As load points are passed, the load will be deducted from the gas flowing, and each time a junction is reached, distribution of the flow into various branches must be made.

For example, in figure 5 a network is shown with supply points at A, B, and C. The various loads total 2700, and the engineer has decided to make a trial balance with 500 being supplied from A, 700 from B, and 1500 from C. Since this is a cut-and-try method, the more experienced the engineer, the sooner he is likely to reach a satisfactory distribution of loads. To aid him in determining the amount of load to be supplied by each supply point, he will take into account the size and location of the loads and the resistance factors of the mains in the network. To enable him to more easily visualize the carrying capacity of the mains, it is common practice to have the various sizes of pipe indicated by different colors. Of the 1500 to be supplied from point C, he has chosen 1400 to flow in pipe section 21, and 100 in section 22. Following the flow in pipe section 21 we find that a load of 500 is indicated at point D, so that amount is deducted from the amount flowing in pipe section 21, and the balance 900 is indicated as flowing in pipe sections 14 and 15. And so on, throughout the network. As the flow is decreased by load take-offs, a point is reached at which there is no more flow. The no-flow point is indicated by an "X".

The author prefers the method of selecting the no-flow points at the outset. In this method, the engineer makes a visual inspection of the network and, by means of no-flow points, indicates the boundaries of the area to be supplied from each supply point. He does this

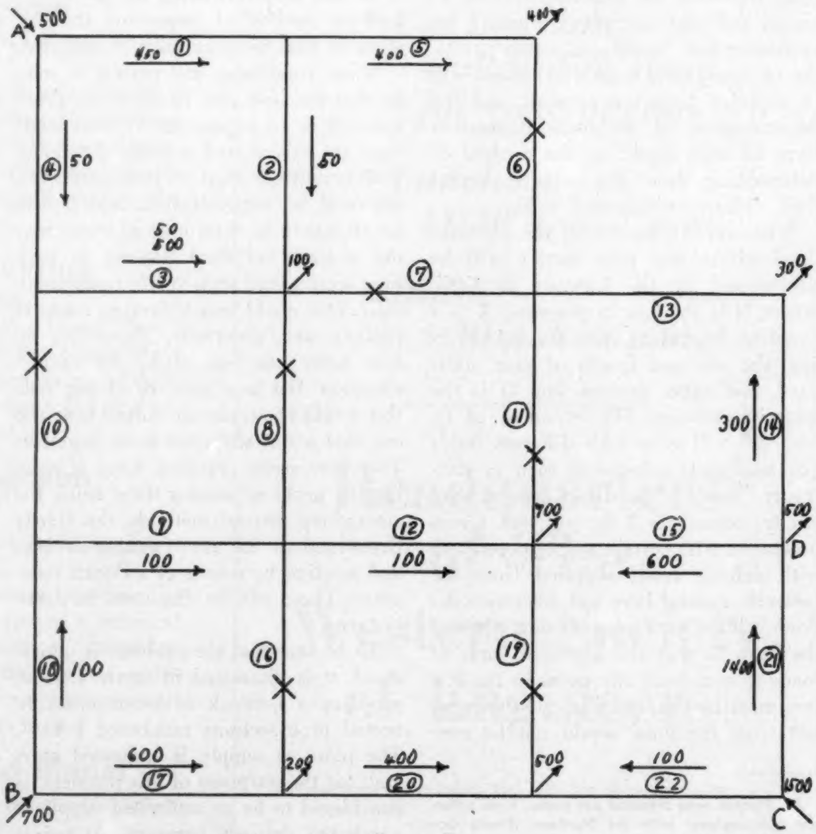


Figure 5

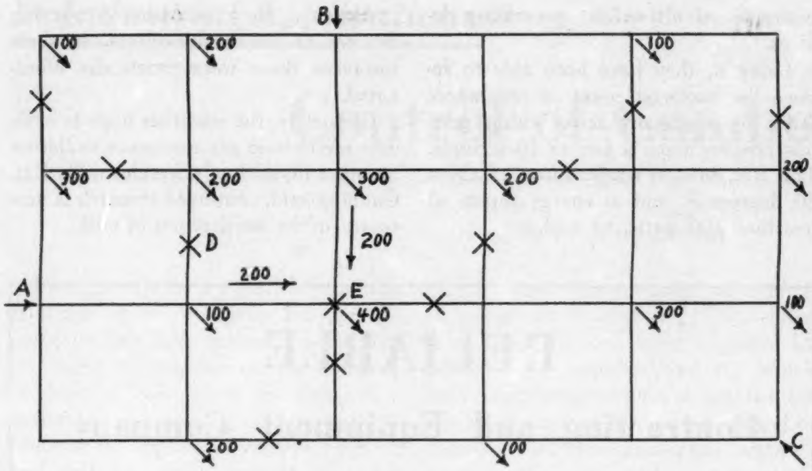


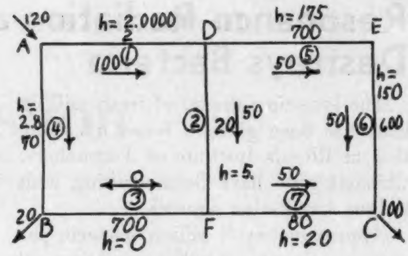
Figure 6

by selecting no-flow points in pipe sections or junctions until he has a system which radiates from each supply point and such that there is no means of connection between any two supply points that does not have a no-flow point indicated on it. The no-flow point may, in truth, be a point of no-flow, or it may fall at a point where a load is removed from the system, in which case a part of the load may be supplied from either direction. Starting from these no-flow points, the flowing loads are summed up back toward the supply point. For example, in figure 6 is shown a network with supply points A, B, and C, and various loads. The engineer has indicated the no-flow points or, in effect, determined the boundaries of the areas to be supplied from the several points. No-flow point D is located between two loads. If the loads have been chosen such that the system will balance, it will be truly a point of no flow. On the other hand, no-flow point E has been chosen at a point where a load is removed from the system, and in this instance, the engineer has chosen to supply 200 of such load from supply point A and the remainder from supply point B. The engineer could, in this instance, have chosen to supply some of the load from supply point C also.

The flowing loads are then accumulated as shown in figure 7 where they are indicated by the figures adjacent to arrows alongside of the various pipe sections.

The resultant map looks much like the one in figure 5, and, in fact, for the same network either method of selecting the flowing quantities in each pipe section, whether by the no-flow point method or by assigning outputs from the various supply points, will result in similar maps at this stage.

To demonstrate the method of solving a network by the cut-and-try method, figure 8 reproduces the simple problem previously presented as figure 4. You will recall that for the first trial illustrated here, the pressure drop from C to A by route CEDA was +327, by route CFDA, +27, and by route CFBA, +22.8. The engineer solving this problem by the cut-and-try method would



Pressure Drops
CEDA: +327
CFDA: + 27
CFBA: + 22.8

Figure 8

then proceed with reasoning something like this. The greatest pressure drop is over the route CEDA, and in this route, the greatest drop is contributed by pipe sections 5 and 6 which have large resistance factors. Therefore, as the next trial, let us reduce the flow in these pipe sections by a large amount, say to 25. Generally speaking, in the cut-and-try method, it is advantageous in the early stages to make bold changes so as to bracket the correct solution. Since the pressure drops from F to A by either route were fairly close together in the original attempt, the natural thing to do would be to apportion half of the additional 25 to be supplied by these routes approximately equally, giving an additional 10 to the route ABF and 15 to the route ADF. The engineer adds somewhat less to the route ABF because of

(Continued on Page 11)

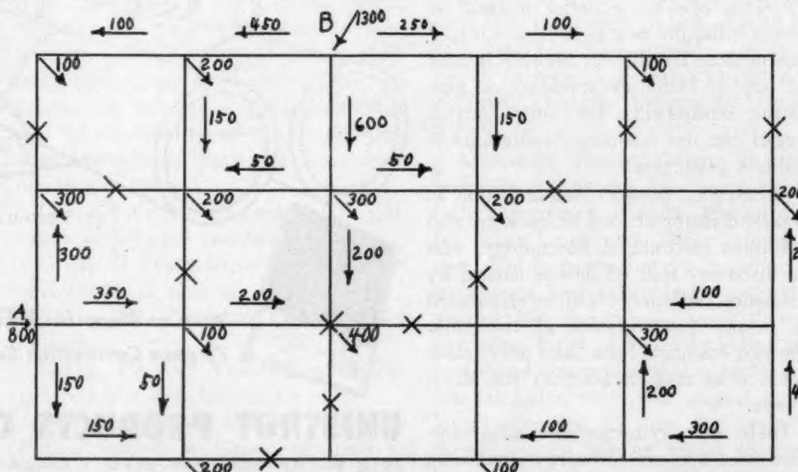


Figure 7

Resonance Radiation Destroys Bacteria

The long-time dream of fresh milk in cans has been given a boost by scientists at Illinois Institute of Technology, Chicago, who have been working with unique irradiation sources.

Approximately 3 billion bacteria per cubic centimeter of milk were destroyed in recent experiments using mercury-in-gas resonance radiation, Dr. Harry E. Gunning, associate professor of chemistry at Illinois Tech, said Mar. 14.

Speaking before the Chicago section of the Institute of Food Technologists at the Palmer house, Gunning said storage of milk without changing quality of flavor could revolutionize marketing of milk to the armed forces, housewives, and other consumers.

In order to can or otherwise store whole milk, which is a culture medium. it is necessary to kill the bacteria before they breed and turn the milk sour.

"The trick is to preserve the milk without altering its delicate taste characteristics or nutritional properties," Gunning said.

He explained that flavor side-effects are encountered when milk is irradiated with either ultra-violet light or radiations from nuclear reactors or multimillion volt X-ray and cathode ray machines.

By using the simpler system or resonance radiation, Gunning said the basic causes of off-flavors in milk one day may be discovered and applied to the high-energy sources such as nuclear fission.

Besides offering a better method of storing milk, the new method is cheaper than nuclear irradiation because it does not require elaborate shielding or generating equipment. The only barrier needed for the resonance radiations is ordinary plate glass.

Gunning credited Professor Milton E. Parker, director of food technology, also at Illinois Institute of Technology, with the discovery that off-flavors caused by resonance radiation could be eliminated by proper pre-treatment of the milk. The two scientists have been conducting research in milk irradiation for about a year.

Their mercury-in-gas resonance radiation uses a source of energy containing irradiating properties Gunning called "definitely superior to those emitted by conventional ultra-violet generating devices."

Using it, they have been able to reduce the bacterial count of raw whole milks to practically zero, within periods ranging from a few to 10 seconds. This was done at temperatures of about 40 degrees F. and at energy inputs of less than 100 watts, he said.

Although they encountered varying degrees of flavor side-effects, in some instances these were practically eliminated.

Ultimately, the scientists hope to evaluate mercury-in-gas resonance radiation on other liquid foods, besides milk. But, Gunning said, continued research is necessary in the sterilization of milk.

In Industrial Applications

Control of Combustion

By P. J. Calabrese

I wish to express my gratitude and the gratitude of my company for the opportunity you have extended us to give you some information on the types of combustion safe-guard controls now available commercially and how these controls are applied to various types of fuel burning equipment. It was felt that you would also desire certain information regarding the approval bodies such as Underwriters Laboratories Factory Mutual Insurance Underwriters, and the Factory Insurance Association. Perhaps that would be the best place to start.

Underwriters Laboratories, Inc. is chartered as a non-profit organization and maintains and operates laboratories for the examination and testing of devices, systems, and materials as to their relation to life, fire, and casualty hazards and crime prevention. The Underwriters Laboratories was founded in 1894 and is sponsored by the National Board of Fire Underwriters.

The Underwriters Laboratories is concerned primarily with the manufacture of equipment in accordance with established structural standards of safety. Having once inspected and approved a system or accessory, they are concerned only with the fact that the manufacturer continues to produce that equipment in conformance with the same specifications covering the model or models originally tested in the Laboratory.

Field inspectors for the Underwriters group do not police equipment installed on job sites, but restrict their activities entirely to periodic inspections of products coming off manufacturer's assembly lines.

Underwriters Laboratories has two methods of handling the equipment submitted to them for approval. One is called "labeling service" in which each piece of equipment approved carries the "U.L." label. Theoretically, each piece of equipment bearing the "U.L." label is supposed to have been inspected by a U.L. field inspector and for which each manufacturer pays a set fee for this label service. The second method of approval is "re-examination service" wherein the approved equipment is listed only. This group may or may not carry the "U.L." marking on the device or manufacturer's nameplate. The manufacturer of equipment in this category is charged with the responsibility that all equipment manufactured will be in accordance with the samples submitted and approved.

The checking of equipment installed on jobs is the responsibility of local electrical inspector organizations. These men are provided with complete listings of Underwriter approved devices, and it is within their power to reject the equipment if combined with unlisted units. For example, an electrical inspector in New York City may, at his discretion, reject a burner equipped with controls that are not listed as approved by Underwriters or that are used for a type of service different from that which Underwriters has certified them.

In the case of control equipment, Underwriters classify combustion controls in a way which conforms to their classification of oil burners. For example, the use of a given controller may be extended to all of the following classifications or limited to some combination of them.

Group I Constant Ignition (vertical, rotary or pressure atomizing).

Group II Intermittent Ignition (vertical rotary or pressure atomizing).

Group III Pre and Post Ignition Periods.

Group IV Oil Valve Time Delay (horizontal rotary burners).

The use of combustion controls is further limited by classifying them as "interchangeable" or "integral." These two classifications are defined as:

A. *Integral* approval is given to those devices which in the opinion of Underwriters must be installed on the units which they control by the manufacturer or which must be installed in the field in exact accordance with approved drawings and specifications issued by the manufacturer.

B. *Interchangeable* approval is granted to those controls which in the opinion of Underwriters may be installed on any burner approved for use with that particular control group even though the mounting of the controls has not been factory designed.

In general, integral approval is given for those control units which Underwriters feel will operate improperly unless mounted and installed in a specific and tested manner. Interchangeable approval indicates that Underwriters feel that the function of the control is not dependent upon its physical location.

Combustion controls may carry both an integral and interchangeable listing. They are classified as interchangeable where their application does not affect basic burner design.

Packaged units such as boilers, furnaces and so forth which are approved complete with controls are considered as a unit and the controllers for application on these units are considered as automatic integral listings by Underwriters.

Associated Factory Mutual Laboratories is the testing laboratory of the eight Associated Factory Mutual Fire Insurance Companies. These companies specialize in protection for manufacturing plants and other large properties against fire, explosions, wind damage and other types of losses including loss of use and occupancy. While the Factory Mutual Laboratory will inspect equipment submitted to them by manufacturers, this is only an initial approval. Final approval is on each application. Factory Mutual maintains a relatively

Mr. Calabrese, of the Minneapolis-Honeywell Regulator Company, presented this talk before the Western Society of Engineers on Nov. 1, 1954, at the Society's headquarters in Chicago.

large field force whose specific job is to check each and every application. Before an application can be approved, it is necessary to submit a complete layout showing location of components, wiring diagrams, etc. and the completed installation must be approved by the local Factory Mutual inspector.

They have set forth minimum standards based on laboratory tests and field experience to date and these standards are subject to revision in accordance with future investigations and experience. Likewise, they weigh each job on its own merits and if economically certain requirements are not justified, the field inspector may waive these requirements. It might be said that while their requirements are more rigid than Underwriters Laboratories, they are likewise more flexible to the job requirement.

The following are the performance standards for gas firing, and are applied to:

1. New boilers, 50 horsepower and up

2. Conversion burners, 50 horsepower and up

3. Burner installations of any size, new or in service where a serious production interruption is possible.

The requirements are to provide:

1. A combustion safeguard system with safety shut-off valve in both main and pilot supply. In the event of a flame failure a complete shut-down shall occur in not less than 2 nor more than 4 seconds. As you can see they prefer a cut-off service.

2. Prove the existance of a gas pilot at a point where it will reliably ignite the main burner before permitting the main safety shut-off valve to be opened.

3. Limit the trial for ignition period of the main burner to not more than 15 seconds when an interrupted or expanding type pilot is used. By an interrupted pilot we mean one which is cut-off at the end of a pre-determined ignition timing. Intermittent type of pilot is not acceptable unless the flame sensing means is transferred from the pilot to the main flame during the running cycle. By an intermittent type of pilot we mean one which is in operation all the time the burner is in operation. Continuously burning pilots, as we think of them, with no provision for cut-off, will not be approved.

Recommendations for oil firing are applied to:

1. New boilers 100 horsepower and up (33⅓ gallons per hour)

2. New conversions to oil firing 100 horsepower and over

3. Burner installations on any size boiler new or in service where a serious production interruption is possible.

For heavy oil jobs they require:

1. That a flame safeguard system respond within 4 seconds following a flame failure, with approved safety shut-off valves on both the main and pilot burner fuel lines.

2. That a supervised interrupted or intermittent pilot prove the existence of the pilot before permitting the main safety shut-off valve to open.

3. That the trial for ignition of the main burner be limited to not over 60 seconds. That if an unproved inter-

(Continued on Page 12)

New Product Design Is Stressed

Business leaders meeting in Kansas City, Mo. on Mar. 11 agreed a key to company survival under growing competition was development of new product designs and advanced sales planning.

"If we rely on an ambulance chasing approach, we will never catch up," D. C. Hooper, manager market planning, Westinghouse Electric Corporation, Pittsburgh, Pa., told a conference on Management Appraisal of Market Research, sponsored by the Midwest Research Institute.

"Leadership will go to the company whose products introduce new ideas and features. As extensive research programs continue and business becomes increasingly competitive, we can expect the design life of our products to continue to shorten. Survival in this atmosphere requires advance product and sales planning.

"Leadership in product design will not be created in a vacuum. It will originate only from a definite program that includes thorough knowledge of the functions the equipment is to perform and the conditions under which the customer will select and use it. The right starting place is for market research to gain a thorough knowledge of the customers' intended use of the products and to define, from the customers' point of view, what product development is needed. Our commercial problem is to seek the right value compromise between superior features and price."

Charles N. Kimball, president of the Institute presided over the day-long conference.

Importance of predicting sales volume and selling price was emphasized by Kenneth Spencer, Spencer Chemical Co.

"Without alert and able market research work, both normal sales planning and management decisions regarding the development and introduction of new products will be seriously handicapped," Mr. Spencer said.

"Market research is an essential element of an effective business effort. It is the 'eyes and ears' of business planning, because it provides the factual base, and frequently the analysis of intangible factors, on which business plans must be built. Over the years, I have become impressed with this simple truth: business ventures most often succeed or fail according to the accuracy with which the sales market has been estimated. Manufacturing costs, engineering requirements, and organizational needs can be projected with reasonable confidence. Unless the sales volume and selling price can be skillfully and accurately predicted, the entire venture proceeds upon a very shaking foundation."

Spencer advocated market research managers reporting directly to the president. He claimed that in order to be effective market research must have "broad contacts throughout a company, must be kept advised of basic company planning, and must have enough stature to deal with the various executive levels.

"My point is this," he concluded: "a basic acceptance by management that the effectiveness of market research requires contacts that cut across departmental lines and frequently involve direct access to top management must be recognized."

Speaking for the Maytag Company, Roy A. Bradt declared their market research department was used for the following three major purposes: (1) sales analysis and market development in which the field organization is kept constantly aware of the standing of each unit compared with the industry as a whole; (2) sales forecasting and distribution analysis in which both long range

and short-range forecasting is studied; and (3) consumer and product research.

Bradt described the importance of going to the source of all information—the public, which, he said, sets the styles, determines the models, the functions and the service required by the housewife and indicates unmistakably the trend of retail buying. Involved closely with this also, he said, was "consumer motivation research, which tells the manufacturers why women will buy some products and not others, why they are affected by some features and not others, and what in the end motivates them to buy one product above another.

"I highly favor the advantages of figuratively using your binoculars and taking a long searching look down the road ahead for four or five years or even longer," Bradt said. "You might see a number of things that are not apparent on the surface of your distribution pattern today, but which are subsurface trends that will bloom into active market shifts in two, three, or four years to come."

Harold Thayer, vice-president, Mallinckrodt Chemical Works, St. Louis, pointed out he was speaking from 15 years experience with that company in the field of marketing research.

"As many chemical manufacturers have found, the timing and temperature of the market are perhaps even more important than the time and temperature of the chemical reactions involved in producing the products of the chemical industry," Thayer said.

"Watching a market going from cold to hot is only a pleasant experience for a company which is prepared to act—prepared with supplies, promotional material, plant capacity and the ability to provide service for potential customers.

"Marketing research provides a method for being at the right place at the right time with the right products. Teamwork must be created and nurtured between the quantitative thinkers of scientific research in the chemical industry and the interpreters of impressions in the marketing research field."

The Pinnacle

Truth is the highest thing that man may keep. —Geoffrey Chaucer

Welding Laboratory Likened to Hospital

A well-equipped welding laboratory to an engineer is much like an efficient hospital to a doctor, the first annual Midwest Welding conference was told recently at Armour Research Foundation, Chicago.

Perry C. Arnold, welding engineer at the Chicago Bridge and Iron company, described his efforts to design and put into operation a field welding laboratory for the company.

The welding laboratory was established to conduct manual welding tests on large size plates, for research work on automatic and semi-automatic welding equipment, and for training welders, Arnold said.

Six booths are provided, each having a table and storage bin for plates, electrodes, and a jig for holding the test plates. Dust and fumes are removed by an exhaust fan and suitable duct work, he explained.

One of the most important pieces of testing equipment in the laboratory, according to Arnold, is a tensile and compression machine for pulling welded tensile specimens and applying compression loads to free bend specimens.

Other equipment, he said, includes:

—An X-ray machine to determine whether a weldment is faulty, and for training welding supervisors in the use of the equipment.

—An air conditioning system to control the humidity, since a dry atmosphere gives good corrosion protection to metallurgical instruments.

—Two types of hardness testers, one for determining the hardness of materials and weldment, the other for checking microscopic grains of a material.

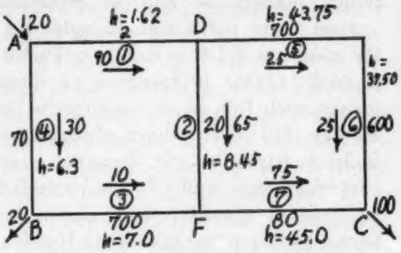
—A metallascope that produces a magnification of 2,500 times for examining the structure of the material, the heat-affected zones, and the weld metal.

Arnold said a darkroom for processing microphotographs and a classroom that doubles as a conference room also are included in the welding laboratory building.

Distribution of Flows

(Continued from Page 5)

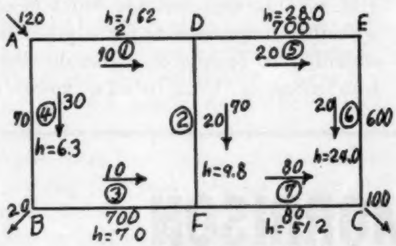
the large resistance in pipe section 3.



Pressure Drops { CEDA: + 82.87
CFDA: + 55.07
CFBA: + 58.30

Figure 9

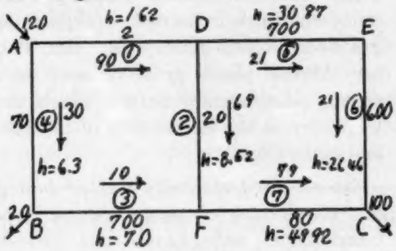
The new pressure drops, as shown in figure 9, are then calculated, and we find that for route CEDA the drop is +82.87, for CFDA, +55.07, and for CFBA, +58.30.



Pressure Drops { CEDA: + 53.62
CFDA: + 62.62
CFBA: + 64.5

Figure 10

Again the engineer would make new estimates of the flows as shown in figure 10, reasoning something like this. The pressure drops converged a good deal due to the changes from figure 8 to 9, but I didn't go quite far enough in reducing the flows in pipe sections 5 and 6. So I will reduce them another 5 and put the increase into pipe section 2 as that will tend to increase the drop over route ADF to that over route ABF. Pressure drops are then calculated as shown in figure 10, and we find that the drop from C to A by route CEDA is +53.62, by route CFDA, +62.62, and by route CFBA, +64.5. For engineering purposes, this network will usually be considered balanced at this stage.



Pressure Drops { CEDA: + 53.95
CFDA: + 60.06
CFBA: + 63.22

Figure 11

But for illustrative purposes, one more step is shown in figure 11, the engineer reasoning something like this. In reducing the flow in pipe sections 5 and 6 to 20, I seem to have gone a little too far as the drop over route CEDA is less than over the other routes, so I will increase the flow in those sections to 21 and reduce the flow in pipe section 2 to 69. The pressure drops being then calculated, we find that the drop from C to A by route CEDA is +58.95, by route CEDA, +60.06, and by route CFBA, +63.22. Thus we have gained somewhat over the last stage. It is difficult to get an exact solution by the cut-and-try method. On the other hand, even in a large network it is not too difficult to reach a solution which is satisfactory for engineering purposes.

(Part 2 will appear in the next issue)

Automatic Flight Seen

Underway is a one-million-dollar project to design comprehensive digital-computer control for high-speed military aircraft and guided missiles, Control Engineering, McGraw-Hill publication, reports. Rapid advances in digital computing make possible new plans for miniature digital airborne computers that will make completely automatic all flight and tactical operations. As compact lightweight packages, these will automatically control simultaneous functions such as flight, navigation, engine and fire control.

Anger and Reason

Anger is never without a Reason, but seldom with a good One.

—Poor Richard's Almanack

Control of Combustion

(Continued from Page 8)

rupted or intermittent pilot is used, the trial for the main burner ignition is limited to not over 15 seconds.

4. That the gas pressure in the pilot gas line should be supervised by a pressure switch so that on a start-up the pilot burner safety shut-off valves can be opened only when the pressure is sufficient so that the pilot flame will reliably ignite the main burner.

5. That the burner can only be started on low fire, which should not exceed 33% of the maximum firing rate.

The light oil requirements are:

1. That the main flame shall be supervised and the trial for ignition of the main oil burner be limited to 15 seconds.

2. That if an approved pilot is used on light oil applications, a trial for ignition period up to 60 seconds will be accepted.

3. That interlocks are furnished to insure low fire starting.

Generally, Factory Mutual prefers cut-off service. However, they have approved re-light service applications where the condition of the application legislates against cut-off. However, they will not approve of the immediate return of a direct spark ignition on flame failure. They will permit re-light where the gas pilot is proven before permitting the main fuel valve to be re-opened.

On gas fired manually lighted boilers, flame safeguard systems are recommended for installations up to 500 HP. Their recommendation stops at this point due to their limited experience on gas fired boilers above this point. Factory Mutual places great reliance on a strong reliable pilot burner which can be proven at the intersection of the pilot and main flame.

On oil fired manually lighted boilers the installation of photo electric type combustion safeguards has proven worthwhile and is recommended. There should also be interlocks with draft fan so that the system could not be put in operation without its fan running.

Factory Insurance Association commonly known as F.I.A. is composed of 103 member stock insurance companies and concerns itself with fire protection in all its phases for its members and policy holders as well as protection against other perils insured against by the members. F.I.A. is similar to Factory Mutual in that it approves or disapproves each job on its own merits, including (1) oven, dryer, furnace, or boiler construction, (2) flame safeguard control systems, and (3) fire protection equipment, sprinkler and alarm systems, etc. The home office is in Hartford and they maintain a laboratory in Hartford which is used primarily for demonstration purposes for all types of fire prevention equipment including flame safeguard equipment. F.I.A. differs from F.M. in that they have no specific control requirements in writing and do not approve equipment as such, only its application. A device which has been F.M. or U.L. approved and which meets with their requirements for a given installation is acceptable. Generally they lean more to U.L. listings, however,

they may accept equipment which is not U.L. approved providing they have adequate specifications on the device. F.I.A. likes a continuous standing pilot in preference to the intermittent or interrupted type of pilot.

At the outset of a discussion of this type it is usually a good idea to determine the basic reasons why combustion safeguard devices are used on fuel burning equipment. The first and foremost reason is for safety purposes. It is absolutely necessary that in any type of automatic fuel burning equipment some means be provided to cut off the flow of fuel in the event of a flame outage or a component failure in the safety control itself. The second purpose of combustion safeguard equipment is to find the proper sequence or burner operation so that the burner will start and stop smoothly and function safely and efficiently over long periods of time.

The next logical question that may be asked in regard to combustion safeguards is why use electronic controls? There are other methods that have been in use for many years. Have these methods been perfectly satisfactory or have there been some short-comings? Dipping way back into history we find that the first attempt to supervise a burner utilized the principle of a beam scale. On one side was a weight; on the other side was some type of a reservoir or pan that fitted right underneath the cup of the burner. If the flame was extinguished, the oil would come out in an unburned form and fill the reservoir upsetting the balance and through some linkage attempt to close off a valve. It was rather a haphazard method and didn't prove any flame directly. The next attempt was the use of a stack-switch. With this device we detected a change in the temperature of flue gases. Essentially we gave the flue gases a fixed amount of time to rise to a certain temperature before shutting off the fuel. Here again we did not detect the flame directly and the response to a flame failure was slow. Investigations after accidents, explosions, and fires have indicated that almost 90% of the accidents occurred on start-up. The conclusion, naturally, was that the main fuel did not ignite properly and hence a desire to prove the ignition means directly. The Brown Instruments Division of Minneapolis-Honeywell in approximately 1931 developed a grid glow system of flame detection that was actually the first electronic flame detector ever developed and marketed and was the direct fore-runner of the present day equipment. Its outstanding feature was that it could detect the flame directly and would respond immediately to a flame failure. In other words, the first and most outstanding feature of electronic controls is that they can detect the flame directly. The second advantage that electronic controls offer is that we can prove the pilot right at the point of ignition. In other words, by proper positioning of the flame detector, the pilot has to be of a certain size or in a certain position before we open the main fuel valve. This point alone has proved to be a big factor in reduction of accidents in recent years.

The third major advantage of electronic controls is that we can expect much longer, more dependable life from them than we could from other types of

controls which are available for our use.

Now that we have established the reasons for using electronic controls, let's discuss for a little while the methods of electronic flame detection. I mentioned previously that the Brown Instruments Division of Honeywell marketed the first practical flame detector. This system of flame detection depends on the ability of a flame to conduct an electrical current and the ability of a gaseous phototube to conduct a current in the presence of light. This system then on a gas application would employ the use of flame rods. The advantage of the conductivity flame rod is ease of application and the fact that the flame rod will prove the pilot at the point of ignition. But, there are a number of disadvantages. Possibly the outstanding disadvantage is that this type of flame rod can prove lazy with unsteady luminous raw gas pilots whose temperature can be below the ignition temperature of the main fuel. Second, shielded cable must be used because induced currents in the flame detector wiring can energize the flame relay. This particular type of system is unable to differentiate between flame and high resistance shorts that may be caused by condensation on terminal blocks, by moisture in wire insulation, by carbon deposits from flame rod to ground. The flame rod can be used upon gas only under conditions where you can expect long life. Burners of certain design cause flame rod deterioration because of high temperature—by that we mean about 2200 degrees F.

As you can see, although the conductivity flame rod has certain advantages, the disadvantages seem to outweigh them by far.

The photocells that are used with the conductivity system are easily applied. They can be subjected to ambient temperatures up to 165 degrees F. and are low in cost but many of the disadvantages we have already cited for the conductivity flame rod hold true for the conductivity photocell—that is, shielded cables required are not able to differentiate between high resistance shorts and a flame, plus the fact that this type of cell will not detect a non-luminous gas flame.

During World War II, Honeywell engineers developed the rectification type of flame detector. This method of flame detection depends upon the ability of a flame to change alternating current to direct current, and the ability of a vacuum photocell to change alternating current to direct current in the presence of light. The rectification flame rods have the advantage of being easy to apply and will prove the pilot at the point of ignition. The rectification system was designed so that the flame would be the only possible place to obtain a signal to actuate the relay. Therefore, there is no place in the circuit for the D.C. signal needed to actuate this relay to come from except from the flame itself.

The second advantage of the rectification system, and one that possibly is not too obvious, is that in order for this system to function properly it is necessary to have a very hot steady pilot. This matter of this rectification system needing a hot steady hard blue pilot may have been the cause of some of the original complaints toward the rectification system. It sometimes seems that manufacturers of burner equipment feel the only purpose of the pilot is to ignite the main fuel and any type of a pilot in their opinion will suffice. Years ago this was probably a justifiable attitude but today with the cat-cracked oil that's available, this viewpoint must be changed. Actually, the oil that is available today is much more difficult to ignite, needs considerably more heat, and therefore the pilot that was probably satisfactory years ago is in all probability unsatisfactory today. It is the

opinion of engineers who know the rectification system that this requirement is a definite advantage because the rectification system is able to differentiate between a poor pilot which may cause trouble on an ignition and a good pilot which will give proper ignition. Another advantage of the rectification flame rod is that it is so easy to see what you are doing. It's far simpler to apply safely and I emphasize the word safely in this system more than in any other type of system. The flame rod must be in continuous contact with the supervised flame and this fact enables the installer to easily position the rod for the desired safe results. The rectification system does not require shielded wire between the flame detectors and the relays because it is impossible to induce a D.C. current of sustained value. The knowledge of the fundamentals of electricity tells us that an induced voltage is always of the alternating variety. The rectification system is not sensitive to alternating currents.

But there are disadvantages to rectification flame rods as there are disadvantages to any system. In order for the flame to change alternating current into direct current, it is necessary to maintain a certain ratio of ground area in contact with the flame to electrode area in contact with the flame. This means that it is very frequently required that a pilot be designed especially for the rectification system. The pilots that were in existence before the rectification system was available are pilots that were not designed specifically for this rectification system and few are useable in that type of flame detector. It could easily be pointed out, however, that most of the pilots that were in existence before the rectification system were inadequate in other respects and therefore should be redesigned anyway. This, incidentally, is the viewpoint of quite a number of burner manufacturers.

Another disadvantage of the rectification flame rod is that in extremely high ambient temperatures, that is above 2200 degrees F., the flame rod can deteriorate or burn out.

Certain gas-oil burners happen to require different flame rod locations for each fuel, requiring a shift of the location of the flame rod when converting from one fuel to the other. Of course, the main disadvantage of the flame rod is the fact that it cannot detect an oil flame as satisfactorily as it can a gas flame.

The photocells that are used with the rectification system are of the high vacuum type. They are low in cost and can be subjected to ambient temperatures of 165 degrees F. The disadvantage of this type of cell is that it cannot detect non-luminous flames. It is possible with the photocell for nuisance shut-downs to occur, and if you are looking at a hot enough refractory with this cell after you have cut off the fuel, the nuisance shut-down will occur and for certain applications to extremely compact burners, this type of cell is therefore not desirable.

Now let us go to the next type of combustion safeguard system that is currently available on the market today. It's called the flame frequency response system and basically this method of flame detection depends on the ability of a lead sulfide photocell to respond to varying infra red radiation from the flame. The electronic amplifier and the relay used with this photocell are designed to be most responsive to the same band of radiation frequencies as produced by a live flame thus enabling this system to differentiate between varying and steady infra red radiation. The advantages of this system are that a single cell will respond to both gas and oil flames. A single cell can be positioned to detect both pilot and main

(Continued on Page 18)

Las Vegas

Or life at a

Interesting subjects

Friday, March 4, was the occasion of another exciting highly successful Ladies Night Party at the Western Society.

The Social Hour was held in the lounge beginning at 5:30. Following that came the excellent dinner, advertised in the flyer sent to each WSE member, as "buffalo steak and swordfish."

Pleasant conversation

Exciting moment

H
i
g
h-lights

WSE Party

The rollicking rhythms of the Range Boys furnished appropriate music, adding just the right zest and flavor to the festivities.

After dinner, members and their guests enjoyed merriments best described as: in the style "à la carnival."

Relaxing moment

What did you say?

It's just stage money — so step right up.

Control of Combustion

(Continued from Page 15)

flame. The cell is very compact enabling its use in confined spaces and the cell has very long life. As is true of every other system known today, the flame frequency response system has its disadvantages. First of all, let me emphasize the ambient temperature requirement. Chemically the lead sulfide deposit on the cell cannot ever be subjected to temperatures above 125 degrees F. without danger of permanent damage. Please bear in mind we are not speaking of lead sulfide cells of any particular manufacturer. We are speaking of lead sulfide cells in general. The chemistry of lead sulfide cells is the same regardless of who manufacturers them.

The second disadvantage is the fact that the cell's sensitivity decreases rapidly with a rise in ambient temperature dictating that the operating temperature be as low as possible.

Now think back, how many boiler rooms or fire rooms have you been in? Were they nice cool places? Incidentally, if you happen to find a nice cool boiler room some day, I'd like to know about it because most of them I have ever gone into have had ambient temperatures in the neighborhood of 100 degrees or more, unless it was a very cold part of the winter and enough fresh air was brought in to keep the place cool, but the merits of a flame detector whose characteristics can change so are in my opinion questionable.

The cell's sensitivity also will decrease with high intensity radiant background. In other words, if you are not careful and you don't keep this cell pointed away from hot refractory you can decrease its sensitivity to the point where you will have nuisance shutdown. Definitely an undersirable condition. Under certain conditions, the cell cannot distinguish between the flame and the refractory radiation with air blowing in front of it. Now I know all of you have looked into combustion chambers while the burner is being fired and have noticed how the wall seems to shimmer. If you should cut off the flow of your fuel you will find that the hot refractory will still be shimmering, so while it is true that hot refractory gives off steady radiation, it is also true that this shimmer effect can be caused by varying air densities refracting the light from the refractory and will give the the same indication to this cell that a live flame will and could hold in it. It is very difficult to find a single location which will detect an adequate pilot and a main flame and yet is not subject to the previous mentioned refractory difficulties. Wiring placed in with other wiring or placed in flexible conduit is not satisfactory. Last but not least, the equipment costs considerably more than the rectification type of equipment.

Now that we have discussed the various types of flame detection, let's talk about how this equipment or these devices are applied to fuel burning equipment. If you go back perhaps to your junior high school days when you took up the highly important subject of general science you will recall the textbook pointed out three things necessary for combustion, namely, fuel, oxygen, and temperature. Without all three of these things existing at the same time your fire would not continue or your flame would be extinguished. In order to burn fuel, five basic steps must be followed. You must first get the fuel into the combustion space, you have to get air into the combustion space, you must mix the air and fuel thoroughly, the mixture must then be heated to its kindling point, and then it is necessary to remove the products of combustion.

Oil is almost always delivered to the combustion chamber under pressure by means of the fuel pump. The air is supplied partly by means of natural draft, partly by means of a motor driven fan, or in some cases completely by forced draft fan. Gas is usually delivered to the burner under pressure varying anywhere from a few ounces per square inch up to several pounds per square inch. The matter of mixing the fuel and the air for efficient combustion has probably caused more discussion, caused more research, caused more patents to be issued, than any other single thing. Every burner manufacturer has his ideas

of how to best accomplish the mixing of fuel and air for proper combustion. I am in no position to discuss the merits or demerits of one particular burner design as against another, but let's talk about some of the general methods used for getting the fuel into a burnable state. Speaking of oil, the most common method is pressure atomizing. With this method the oil is forced into a nozzle under high pressure 100 pounds per square inch or more. The nozzle is designed to admit a very fine spray of oil which in turn collides with a fast moving stream of air thus insuring immanent mixture of fuel and air. By far the vast majority of residential oil burning equipment depends on this principle for operation. Another method which is similar to this is the use of high pressure air or steam to atomize the oil as it is admitted from a nozzle. Usually the heavier fuels are employed because this method is considerably more expensive than the straight pressure atomizing type of burner to build. Mechanical atomization is probably the most common method of burning heavy oil. Here a spinning cup of conical shape has oil dropped on its inner surface. Centrifugal force flattens the oil out to a very thin film. This film by virtue of centrifugal force works its way out to the edge of the cup and is hurled off at an angle. An air nozzle brings air in contact with the oil at a direction so that vectorially the result is almost straight into the combustion chamber and the fuel air mixture forms a conical shape in front of the burner nozzle. There are, of course, other types of burners, but the three previously mentioned are the most common and the ones you're most likely to have experience with. Generally speaking, the light oil burners will ignite directly from a spark ignition whereas your heavy oil burners require the aid of a gas pilot in order to raise the fuel oil mixture to its kindling point. Frankly, there just aren't enough BTU's available in a spark to get a heavy oil up to its proper ignition temperature unless some other means is used. I don't mean to infer that there are no heavy oil burners that utilize spark only for ignition but we're talking only in generalities and generally speaking, you need a spark ignited gas pilot on a heavy oil burner.

To date there has been no better flame detector found for luminous oil flame than the vacuum photo cell used in the rectification system. Generally speaking, to supervise a light oil burner you need only the photo cell so mounted as to pick up the main flame. The heavy oil burners that are ignited by gas pilots usually require that you prove the pilot first before opening the main fuel valve. It means that some sort of a flame detector is needed on the pilot. You can use either a flame rod or the flame frequency response detector. In other words, you can use either the flame rod or the lead sulfide cell to pick up the pilot flame.

Gas burners fall in two general types, atmospheric and power. The atmospheric burner depends on natural draft for its air supply and depends on the fact that the gas is supplied under pressure to force the fuel into the combustion chamber. The power type gas burner employs a fan to supply primary air for combustion but still depends on the gas pressure in the main to bring the fuel into contact with the air. Gas burners take almost an infinite variety of forms. You have up-shot, in-shot, ribbon, glow, port, ring, fan, mixed, etc. There is a zero governor type, there is a tunnel type, premix type, in fact there are so many, we could wind up our discussion on gas burners with the statement that unless extremely hot conditions are encountered, a flame rod is very satisfactory and can be used on most gas burners. The only reason a flame rod is not recommended for all flame is because the impurities in oil cause chemical erosion which is commonly referred to as burning up of the flame rod; on gas equipment, however, it doesn't involve this problem. A lead sulfide cell type of detector works very well on a gas flame also, so that you have your choice of either using a flame rod or a lead sulfide cell depending upon the particular characteristics of the burner.

Perhaps some of you here are concerned with the writing of specifications and after what I have said so far, you may find yourself considerably more confused than you were previous to the start of this discussion, but that was not intended I assure you. As a general instruction to a specification writer we could suggest that the specification writer follow a definite plan. Actually, unless the individual is biased toward one particular system or toward a particular manufacture, he doesn't really care which type of flame detector or which type of electronic system he installed on the burner he is specifying. He is very definitely concerned, though, that his client gets the safe dependable job. The fact that flame detection equipment has to work so closely with fuel

burning equipment dictates that the fuel burning equipment manufacturer work in extremely close conjunction with the control equipment manufacturer in applying controls to the burner. I assure you that the burner manufacturer will choose those controls that he finds most satisfactory for his burner, so it is our suggestion that the burner manufacturer have some say-so in determining what controls are supplied with his equipment.

In addition, you have a certain responsibility to the client in that you want him to obtain the most suitable equipment at the least possible expense. You want to determine exactly what sequence is required for the particular job that you are working on and use only the controls necessary to give that sequence. There may be certain approval bodies that will be involved and it is a good idea to determine before hand which these will be and make certain that the equipment chosen will meet with the approval of these inspecting bodies. You are concerned that your client obtains the proper service after the equipment is installed and therefore some consideration should be given to the manufacturer that can render the best service. We have tried to present this subject material on an unbiased basis. A representative of Minneapolis-Honeywell, we feel, can do that because Honeywell offers today commercially the two most commonly used flame detection methods, namely, rectification and flame frequency response. We hold that each has its application, one system is no better than the other. They are on a par with each other. The only thing that we do believe is that the control manufacturer and the burner manufacturer are in a better position to determine what type of flame detector is best suited for the burner in question. If specifications call for one specific type of flame detector, a handicap is given to those burner manufacturers whose burner design cannot use the specified flame detector efficiently. It is our contention and our belief that people of your caliber who actually are involved with this equipment would prefer to do business with a manufacturer who will recognize the short-comings of his equipment and not make recommendations merely to get business. I feel sure that no one would have much confidence in a surgeon who recommends an operation to a patient just because business is getting slow.

Gentlemen, the next time you are called upon to give an opinion on controls for fuel burning equipment, please give them every consideration. Keep in mind the above mentioned facts and I feel certain that by close coordination between the burner manufacturer and the control manufacturer, the ultimate customer will benefit from a standpoint of both economics and safety.

Miracles of . . .

Remote control can create some unusual situations, Electronics, McGraw-Hill publication, points out. Recently, a California broadcast transmitter, equipped for unattended operation by remote control, went off the air without warning. The studio was mystified—until it learned that the distant building housing all the gear had burned to the ground.

Better Cleaners Are Needed

"The greater use of aluminum alloys points up the need for less corrosive cleaning compounds safe on sensitive surfaces. Neutral synthetic detergents are being employed in many cleaning jobs formerly requiring highly alkaline soaps and detergents. The nonionics in particular are being 'tailor made' for improved detergency.

"Practical cleaning techniques have thus far greatly outstripped fundamental knowledge about the cleaning process, but more attention is now being paid to the physical chemistry of hard surface cleaning. As a result of this increasing study of soils, surfaces, and detergents, more effective cleaners are coming.

"Trends in general cleaning point to the use of better machines and improved detergent compounds as part of a carefully planned cleaning program to keep the plant as clean as possible at lowest cost."

CRERAR LIBRARY

News and Notes

At the invitation of the Board of Education, Crerar's Associate Librarian recently spoke at the monthly meeting of job counselors from Chicago's high schools. Various aspects of librarianship as a career were presented, together with indication of the many opportunities available in the field of special industrial library work. This information was for the counselors' use in talking with and advising their students on possible careers.

* * *

Under the auspices of the State Department, a number of librarians from foreign countries have been spending some time in this country becoming acquainted with American library practice. Crerar Library is usually one of the institutions visited, due to its international prominence and a number of unusual features of its content and operation. One recent group consisted of twelve university librarians from India, who spent half a day touring various departments; several of them made a repeat visit because of special interest in science. A second group included a university librarian and architect from Japan, with their interpreter. Language barriers are usually overcome sufficiently well to make such visits profitable—it is hoped.

* * *

Approval has been given by the Special Libraries Association for the publication of a monthly list of translations added to the S.L.A. Translation Pool now operated by Crerar for the Association. Two separately published bibliographies have included a large number of the several thousand titles on deposit. The new periodical, available at $5.00 per year, will continue this listing on a current basis and will have semi-annual cumulative author indexes.

AS-EE Releases Data On Aids in Teaching

Nearly 300 teaching and learning aids in three branches of engineering and in mathematics and mechanics are described in *Educational Aids in Engineering*, an illustrated, indexed 72-page catalog published March 25 by the American Society for Engineering Education. Future editions will cover other engineering branches and additional service areas.

The 285 educational aids accepted by the ASEE Teaching Aids Committee, originator and sponsor of the project, were culled from a first list of 5,000 aids. Training devices designed to teach specific skills were not included. The first list was cut to 931 items. Each of these was intensively studied.

The brochure outlines needs and procedures for further research in the production of demonstration models, motion pictures, film strips, slides, wall charts, and other teaching aids.

It also urges industry to improve the educational aids it produces. The percentage of such aids which are of good quality is low, the committee says. It gives two reasons — most industrial films, strips, and the like lack a clear-cut purpose and reveal "a series of compromises between company objectives, multiple audience appeal and potential instructional value"; and "most persons responsible for industrially produced aids have little or no experience in engineering teaching and know virtually nothing about the principles of educational psychology."

Universities and government agencies exceeded industry in the percentage of their educational aids which the committee found acceptable. Many of the academic aids were produced at little cost.

By fields, civil engineering led in percentage of acceptable aids. Eighty-three of its final 171 items were regarded as of high quality. Corresponding figures for the other branches are: electrical engineering, 46 of 320; mechanical engineering, 47 of 140; mathematics, 24 of 60; and engineering mechanics, 85 of 240.

The Teaching Aids Committee began work in July 1948. The more than $8,000 needed for its study was contributed by 53 companies.

Professional Directory

New Taconite Harbor Is Under Construction

A new harbor for the transportation of taconite ore is being blasted out of the hard rock shore of Lake Superior, 75 miles north of Duluth, Minn. The operation is part of a $300-million project which will start feeding taconite to the nation's steel industry by 1957, according to Engineering News-Record, McGraw-Hill publication.

Construction of the 30-foot-deep harbor and its 2,444-foot-long concrete wharf requires the removal of approximately 1,000,000 cubic yards of rock over a 35-acre area, much of it under water. Three United States companies and one Canadian company own the Erie Mining Company which is responsible for the project.

The harbor is approximately 4,900 feet long and 1,500 feet wide. Two small islands joined by a rock breakwater will form the outer protection, and other rock breakwaters extending outward from the shoreline will safeguard the sides. Ships will enter one end of the harbor between the breakwaters and leave through the other end.

Contracting work began on the harbor in May, 1954 and is expected to be completed sometime in 1956. The harbor probably will go into operation late in 1957 when the Erie Mining Company's processing plant for taconite, 73 miles inland, is completed.

A new railroad will deliver taconite ore pellets, processed at the plant, to the harbor for loading into lake carriers. Ore cars will travel on a railroad trestle above the bins to discharge their contents. Lake freighters will be unloaded directly from the bins by means of conveyors.

To facilitate blasting and rock removal for the harbor, two cellular steel sheet pile cofferdams or watertight enclosures from which water is pumped to expose lake bottom, are being built around the excavation areas. The first cofferdam was divided into two parts so excavation could be carried on in one area while the second part of the cofferdam was being constructed. After the first portion of the main cofferdam was completed, water was pumped out and blasting began.

The harbor will be excavated to leave a vertical wall of rock which will be faced with concrete to form a solid dock. The ore-loading wharf is 1,200 feet long. On it will be mounted 25 concrete bins for loading taconite. Thirteen additional bins can be built on a 624-foot extension of the dock later on, the magazine reports.

It May Be True

He that would live in peace and at ease, must not speak all he knows, nor judge all he sees.

—Poor Richard's Almanack

MAPPA Plans To Raise $100,000

The Midwestern Air Pollution Prevention association intends to raise $100,000 for a two-year research program into the sources of Chicago's air pollution problem.

Details of the plan were outlined recently by the association's president, Dr. Haldon A. Leedy, vice president and director of Armour Research Foundation of Illinois Institute of Technology, Chicago.

Speaking at a luncheon meeting of the Crerar Library Associates, and advisory group of Chicago industrialists for the technical library, Dr. Leedy said the two-year research program would make it possible for MAPPA to recommend "the most feasible and most economical" corrective action.

"An intensified research program will provide us with ammunition for a rifle-type assault on that menace which soils our clothes, wastes our fuel, and threatens to impair our health," he asserted.

Once the sources of air contamination are determined, Leedy said, MAPPA intends to conduct a widespread educational program designed to enlist the public's support in controlling air pollution.

He pointed out that anti-pollution legislation and smoke abatement devices have been helpful in reducing air pollution, but that no permanent solution is possible without knowledge of the underlying causes of atmospheric pollution.

Leedy said Armour Research Foundation recently completed a $20,000 study for MAPPA which was "a step in the right direction."

The investigation included a limited analytical study of Chicago's settled dust, and a partial statistical survey of the city's smoke violation reports.

The project provided for study of some of the pollutants in Chicago's atmosphere, but little more than a superficial look at the sources of air pollution, according to Leedy.

"Air pollution in Chicago is the result of the many activities necessary in a modern industrial city and, as such, is of a heterogeneous nature," he stated.

Because of the complex nature of the problem, Leedy added, MAPPA has organized its research program to obtain a clearer definition of the factors involved.

He pointed out that Chicago's monthly dustfall averaged 56 tons per square mile during 1954—about 23 tons less per square mile than in 1946, but 2 tons more than in 1953.

"There has been relatively little change in the dustfall figures during the last few years, despite some progress in controlling the city's air pollution.

"This can be attributed, to a large degree, to pollution resulting from more residential and commercial heating units and the expanding activities of industry in the Chicago area," Leedy explained.

He estimated that about a half billion pounds of dust fall on Chicago each year. That's about 100 pounds for each inhabitant, or enough to form a 1/64th-inch layer of dust over the entire city.

Leedy does not believe that air pollution poses an immediate threat to the health of Chicagoans, but he does feel that continued contamination could have a harmful effect, as it did in Los Angeles.

"Economically, air pollution already is costing us millions of dollars. Higher cleaning and ventilating bills are only two of the more obvious results.

"Less noticeable—but just as costly—are the hidden expenses in our cost of living. These include crop damage, corrosion, paint deterioration, and higher fuel bills," he stated.

Leedy said Chicagoans are fortunate that the city is located along Lake Michigan and enjoys a reputation as the "Windy City."

If it were not for these geographical and climatic conditions, the air pollution problem would be much greater."

Contrary to popular belief, Leedy said, the largest contributor to air pollution is the average citizen—not industry.

"Thousands of home and small-apartment furnaces, and the millions of automobiles, trucks, and buses, produce far more air pollution than does the industry of Chicago," he declared.

"Controlling air pollution is like voting. Each of us can make only a small

contribution, yet the final result depends on the sum total of our individual contributions."

Leedy said dustfall studies have led Armour Research Foundation scientists to believe that approximately 45 per cent of Chicago's settled dust is wind-generated; another 45 per cent is combustion dust, and the remaining 10 per cent dust from a variety of industrial operations.

"At least one-half, and probably three-fourths, of the smoke produced in Chicago can be prevented," he asserted.

"One of the principal keys to smoke control is complete combustion. A dense black smoke, for example, will contain well over 50 per cent unburned fuel. In such cases, more than one-fourth of your fuel is going up the chimney unburned," he explained.

The Midwestern Air Pollution Prevention association was formed in 1951 by a group of Chicago area industrial, civic, and governmental leaders to foster the control and prevention of atmospheric pollution.

Penn State Offers Mathematics Course

An advanced intensive course in mathematical methods will be offered by The Pennsylvania State University, June 13-17 on the main campus in State College, Pa. to help people in this field broaden their viewpoints and discover for themselves how new techniques can solve their industrial problems.

The one-week course is designed for staff engineers, representatives of management, and management-advisory personnel from industry, government, education, and military service.

Its main function is to test theories, set up models, formulate new goals precisely and suggest new approaches. It will not replace the experimental or data gathering program, but is intended to supplement it, by reducing its costs and determining what data are most desirable.

Such specialists as Dr. Walter Murdock, General Electric Co.; Professors Abraham Charnes and W. W. Cooper, Carnegie Institute of Technology; Dr. Andrew Vazsonyi, Ramo-Wooldridge Corp.; Dr. Joseph Flanagan, International Business Machines Corp.; and, Dr. Harlan Mills, General Electric Co. will serve as speakers and resource people.

Some of the topics to be discussed include organization of business research, linear programming techniques in decision making, mathematics for business and automation, digital electronic computers in industry, and, statistics and quality control.

The course will be conducted by the College of Engineering and Architecture at Penn State.

For further details, write: General Extension, The Pennsylvania State University, University Park, Pa.

Fear of Competition Called an Old One

Fear of competition with machines is as old as the Industrial Revolution, the Chamber of Commerce of the United States recalls. At one time, workers smashed machines.

Today, this fear has arisen again due to the new automatic machines, popularly lumped together under the term "automation." It is true, the Chamber says, that these new machines will replace some workers. But the Chamber is convinced they will create *more* jobs than they replace.

For example, the new automatic machines will bring an increased output of products requiring additional workers in the distribution and service industries. These new jobs will be more interesting and challenging than the routine operations performed by many of today's factory workers, the Chamber says.

There will also be a big demand for skilled workers, engineers and designers in the manufacture of automatic machines themselves. Further, many will find skilled work in maintaining the machines, the Chamber points out. Checks of some fully automated factories have shown that the working force required was the same size as before the installation of automatic machines. The number of machine operators was reduced, but the number of maintenance men increased.

On Training —

Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Mr. Becker:

Since writing you on September 7, I have had an opportunity to discuss your letter of August 31 with some of my associates and I shall attempt to set forth briefly what preparation we think an engineer should have to qualify him for supervisory and executive positions.

Aside from classroom instruction and knowledge dealing with the technical aspects of engineering problems, there are several other qualifications which engineering graduates should acquire in order to equip themselves as supervisors and for ultimate advancement to executive positions. Among these are:

1. Psychology in handling labor problems. This is especially important these days, with practically all labor having membership in some union organization.
2. Ability to get along with and direct other people.
3. An understanding of the need for cooperation.
4. Business sense.

In a broader sense, a technical engineering graduate should be impressed with the need for doing with his own hands the work which he may ultimately be called upon to supervise. In other words, he should understand that when he becomes associated with industry, there are going to be many occasions when it will be necessary for him to get his hands soiled—that it is necessary to supplement his formal education with a great deal of practical experience. He should be able to see the whole job and at the same time be able to understand the various parts of it.

All these things come with age and experience. The graduate should understand the importance of being patient and not expect to be advanced to an official or executive position until he has learned all about the job which he hopes to direct. Finally, he must acquire the qualities of leadership and the ability to earn the enthusiastic cooperation of his associate workers.

Sincerely yours,
(Signed)

A Record is Set

The #4 open hearth shop of United States Steel Corporation's South Chicago plant established a new production record during March of 211,547 ingot tons, breaking their old record of 211,353 ingot tons established in May of 1953, it was announced by Oscar Pearson, general superintendent.

Iowa Offers Course

The College of Engineering, State University of Iowa, announces the 16th Management Course to be held June 13th through June 25, 1955 in Iowa City.

To the intensive course of instruction is added a series of talks by recognized authorities on new developments, applications, and problems in management techniques. The entire program is designed for those who have need to use these techniques — factory managers, foremen, industrial engineers, methods and time-study analysts, cost men, office executives, and others in related work.

The areas of production planning, job evaluation, motion and time study, wage incentives, plant layout, materials handling, quality control, supervisory training, labor relations and legislation, organization and policy, and public speaking are included.

Communications concerning the course should be sent to J. Wayne Deegan, 118 Engineering Building.

Reviews of Technical Books

TV Troubles

Picture Book of TV Troubles, by John F. Rider Laboratories Staff, John F. Rider Publisher, Inc., 80 pages. Price, $1.35.

Vol. 1 is the first of a series reporting the results of trouble-shooting a large number of T. V. receivers. The presentation consists of excellent illustrations in the form of schematic diagrams and oscilloscope pictures associated with observed facts in the analysis of faults.

The material should be indispensable to those working in the field and employing modern instruments of analysis.

O. W. E., W. S. E.

Transmission Lines

Electrical Elements of Power Transmission Lines, by H. B. Dwight, The Macmillan Company, New York, N. Y. 1954. 183 pages. Price $4.25.

An up-to-date treatment of fundamentals and their practical application to power transmission problems divided into 15 chapter topics illustrated with well selected problems.

It is easily adaptable to either quarter or semester use as an undergraduate course in electrical engineering, and likewise is a good reference volume for those working in the power field.

Among subjects covered are hyperbolic functions, circle diagrams, load studies in network, short circuit currents and stability, traveling waves, skin effects, temperature rise in conductors, cost of copper loss, lightning protection and sag calculation.

O. W. E., W. S. E.

Test Scope Traces

Obtaining and Interpreting Test Scope Traces, by John F. Rider, John F. Rider Publisher, Inc., New York, N. Y. 192 pages. Price $2.40.

The first seven chapters or about one-third of the book is devoted to simple nonmathematical explanation of the shapes of commonly encountered wave forms and examples of their actual appearance. This is followed by a discussion of scope controls and interpretation of scope traces and concludes with test setups for observation with the scope.

No attempt is made to describe trouble-shooting procedures. A large part of the book is devoted to the explanation of the causes underlying the various bad or deteriorated voltage wave forms with illustrations of each type.

The book should be valuable to service people and readily adaptable to both civilian and military schools for service and operating personnel.

O. W. E., W. S. E.

Electromagnetic Waves

Fundamentals of Electromagnetic Waves, by Paul C. Shedd, Prentice-Hall, Inc., New York, N. Y. 1954. 184 pages. Price $5.65.

A book well written for students in physics and electrical engineering, who desire a brief but thoroughly fundamental knowledge of the principles underlying electromagnetic waves.

While rigidly presented, adherence to basic concepts and mathematical relations add to clarity and understanding.

The last four chapters treat of electromagnetic fields in wave guides and antennas.

It is both a good reference volume and senior text for electrical engineers and may be covered in one quarter or one semester of study. 32 chapters, including problems.

O. W. E., W. S. E.

Feedback Control

Feedback Control Systems, by Gilbert Howard Fett, Prentice-Hall, Inc., New York, N. Y. 1954. 351 pages. Price $10.00.

The text provides a basic understanding of feed-back systems, and related choices in methods of attack. It is written on a more advanced level than undergraduate texts. Employing AIEE standard notation, it includes the use of La Place transform approach with consideration of several complex frequency locus methods, synthesis of the Routh-Hurwitz and Nyquist analysis and methods of handling non-linear problems.

The material is well illustrated, supplemented by problems and extensive bibliographies of recent technical literature.

O. W. E., W. S. E.

Test Probes

How to Use Test Probes, by Alfred A. Ghiradi and Robert G. Middleton, John F. Rider Publisher, Inc., New York, N. Y. 176 pages. Price $2.90.

The use of a wide variety of special instrument probes is a practical necessity in TV servicing. It is the purpose of this book to present information in a manner that will make the subject easily understandable to practicing technicians and beginners. Not only the function and theory underlving the probes but the correct use and selection is discussed.

The general coverage includes: Resistive High-voltage, D. C. Probes, Capacitance - Divider, A. C. Probes, Test Cable shielding and circuit loading Fundamentals, Compensated R-C, and Cathode-follower Circuit Isolation Probes, Rectifying Probes for the VTVM and Demodulator Probes.

O. W. E., W. S. E.

Engineering Societies Personnel Service, Inc.

New York Chicago Detroit San Francisco

These items are from information furnished by the Engineering Societies Personnel Service, Inc., Chicago. This SERVICE, operated on a co-operative, non-profit basis, is sponsored by the Western Society of Engineers and the national societies of Civil, Electrical, Mechanical and Mining and Metallurgical Engineers. Apply to ESPS, Chicago and the key number indicated. Prepared ENGINEERS AVAILABLE advertisements limited to 40 words, with typed resume attached may be submitted to ESPS Chicago by members of Western Society of Engineers at no charge.

WELCOME TO A.S.L.E.

Those of us who work for Engineering Societies, Personnel Service, Inc., are very happy to welcome the American Society of Lubrication Engineers into our family of societies sponsoring us. We sincerely hope their affiliation will be long enduring and very satisfactory to all concerned. We cannot perform miracles, but we can honestly try to do all we can to help your members, both employers and employees, try to come up with reasonable solutions of employment problems.

If you have a problem we can help solve, contact our nearest office and they will do all they can for you.

Bonnell H. Allen, Manager
Chicago Office

POSITIONS AVAILABLE

C-2821 SUP. COMBUSTION ENG. TEST. 2 plus yrs. exp. in combustion engine testing preferably or design & development. Duties: field supervision & writing up reports on 1000 hr. endurance tests of combustion engines. Testing company. Sal: $350-$400. Employer will negotiate fee. Travel home weekends. Location: Chicago headquarters.

C-2806 DESIGN & DEVELOPMENT ME or Ae.E. 3 plus yrs. exp. in designing and developing airborne eqpt. Duties: designing and developing gas turbine engines, afterburners and controls. For aircraft mfger. Salary: $6-8000. Location: California.

C-2797 RESEARCH—HEAT TRANSFER ME PhD. Age: 26-35 5 plus yrs. exp. in hydraulic laboratory & design work on eqpt. Duties: research in hydraulic power equipment section heat power department & control problems. For research organization. Sal: $550-$750 per month. Location: Chicago.

C-2786 INDUSTRIAL ENGINEER IE or ME Age: 30-40 5 plus yrs. exp. in sheet metal fabricating. Duties: setting up program of industrial engrg. & making it operate. For a sings mfger. Sal: $8-12,000. Employer will negotiate fee. Loc: Ohio.

C-2785 CHIEF INDUSTRIAL ENGR. IE or ME preferred. Age: 30-40. 6 plus yrs. exp. in industrial engeg. on sheet metal products. Know: of M.T.M. & I.B.M. use. Duties: directing department of industrial engrg. covering time studies, standards, incentives, material handling, work flow, etc. For a mfger of office furniture. Sal: $10,000. Location: Fox River Valley.

C-2782 PLANT ENGR.—Age: up to 40. 5 plus yrs. exp. as plant engineer in heavy eqpt. & constr. as well as plant layout. Know: power plant operations. Duties: as plant engr. in charge of entire plant engrg. & maintenance. For a mfger. of heavy machy. Sal: $10,000. Employer will negotiate fee. Loc: Wisconsin.

C-2778 CHIEF DESIGN ENGR. Chem. Eng. Age: 32-45. 6 plus yrs. exp. in overall designing and overall operating of chemical metallurgical plts. Know: stainless steel or aluminum. Duties: heading up design dept. as chief engr. developing new ideas in changes of chemical & metallurgical eqpt. in general. For a mfger. of metals. Sal: $85-10,000. Employer might neg. fee. Loc: Tennessee.

C-2776 ASST. SALES MGR. 3 plus yrs. exp. directing and developing sales of record changers and tape recorders. Know: distributors & industrial sales. Duties: directing & developing sales through appl. and parts distributors or thru direct sales to industrials for line of tape recorders and record changers. For Mfger. sound equipment. Sal: $8-10,000. Location: Chicago area.

C-2775 DEVELOPMENT—5 plus yrs. in designing or developing record changers or tape recorders. Duties: developing record changers & tape recorders/For mfger. sound eqpt. Sal: $10-13,000. Loc: Chgo. area.

C-2772 ASST. WORKS MGR. Age: 30-55. 5 plus yrs. exp. in supervising mfg. of television sets. Know: production scheduling & coats. Duties: assist works manager in the manufacture of T.V. sets. For a T.V. Mfger. Sal: $9-12,000. Loc: Chgo. Area.

If placed in a position as a result of an Engineers Available or Position Available advertisement, applicants agree to pay the established placement fee. These rates are available on request and are sufficient to maintain an effective non-profit personnel service. A weekly bulletin of positions open is available to subscribers. Apply ESPS Chicago.

ENGINEERS AVAILABLE

152 MW PROFESSOR 30 M.Sc. 9 mos. Jr. Scientific & Tech. Asst. on mathematical study of radar scattering. 4 yrs. research asst. on design development, material testing, mech. engrg., and engineering mechanics. $6600 Midwest.

153 MW METHODS 29—3½yrs. estimating and job order control. 2½ yrs. production control, time study, engrg., standards of heating & vent. eqpt. $5400 Midwest.

154 MW PETR. ENGR. 43 ME 4 yrs. resp. for infor; concerning lubrication requirements of Ind. Eqpt. 3 yrs. resp. for quality of metal working product. 4 yrs. sales and appl. of lubricants, fuels and other petroleum products. $10,200 Chicago.

155 MW SALES MGR. 50—18 yrs. Direct sales activities for combustion and chem. engrs. 7 yrs. steam & combustion engr. for steel mill. 5 yrs. operation construction engr. $7000 Midwest.

156 MW PRODUCTION ENGRG. 41 Gen. Engrg. Degree. 4 yrs. supervision of installation, maintenance, mining, and hoisting of ores. $8000 Midwest.

157 MW CHEMIST 37 Chem. 5½ yrs. authorized purchase of materials, process studies, and recommended solutions for chem. & food plants. Installed statistical quality control $550 Chg.

158 MW CHEMIST 26 Chem. 3½ yrs. Control and analytical work, ran organic syntheses, primarily of monomers, amines & organic peroxides, research. $4900 Chicago.

159 MW 46 MS Chem. Engrg. 7 yrs. research in chem., ceramic & minerals. 2½ yrs. sales of matl. handling eqpt. 6 yrs. taught chem. engrg. courses. $7500 Midwest.

160 MW PURCHASING 40—9 yrs. purchasing of all items necessary for machine manuf. & presses and metal fabrication. 2 yrs. procurement engr. for mfgr. of tractors. $7500 Chicago.

161 MW PURCHASING 34—7 yrs. purchased forgings, castings, tools, steam and R.R. Machinery. $5000 Chicago.

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

140-54 Dale V. Geiger, Marine Engineer, FitzSimons and Connell Dredge & Dock Co., 10 N. La-Salle St.

141-54 Sheldon H. Biales, Men's Residence "X," West Lafayette, Ind., —attending Purdue University.

142-54 George M. Henry, Division Manager, Cardox Corporation, 307 N. Michigan Av.

143-54 Wesley T. Dumser, Assist. Chief Engineer, Panellit, Inc., 7401 N. Hamlin Av., Skokie, Ill.

144-54 Charles W. Tarman, Designer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

145-54 Wilson W. Wheeler, Sales Manager, Askania Regulator Co., 240 E. Ontario St.

146-54 John W. Baggott, Mechanical Engineer, American-Marietta Co., 101 E. Ontario St.

147-54 Victor T. Holmsten, President, Consolidated Chimney Co., 8 S. Dearborn St.

148-54 J. E. Lindstrom, District Staff Planner, Commonwealth Edison Co., 72 W. Adams St.

149-54 Kenneth H. Williams, Telemeter Corporation of America, 200 Stoner Avenue, Los Angeles 25, Calif.

150-54 Fred E. Hamren, Assist. District Foreman, Commonwealth Edison Co., 72 W. Adams St.

151-54 Lloyd J. Austin, Owner—Austin Technical Writing, 14 W. Hinsdale Av., Hinsdale, Ill.

152-54 Ernest A. Bagnard (Rein.), Manager — Door Dept., Ceco Steel Products Corp., 5601 W. 26th St.

153-54 George W. Hendrickson, Vice-President and Chief Engr., Hendrickson Motor Truck Co., 8001 W. 47th St., Lyons, Ill.

154-54 Edward C. Medal, Senior Designer, Commonwealth Edison Co., 72 W. Adams St.

155-54 Robert H. Perry, Supervising Design Engr., Commonwealth Edison Co., 72 W. Adams St.

156-54 Michael F. Cosgrove, Assistant Engineer, Commonwealth Edison Co., 72 W. Adams St.

157-54 Kenneth Forrest, Chief Engineer, Soiltest, Inc., 4520 W. North Av.

158-54 William Kadans, Engineer, City of Chicago, Dept. of Water & Sewers, City Hall.

159-54 Lawrence A. Cullen, Industrial Relations Representative, Commonwealth Edison Co., 72 W. Adams St.

160-54 Louis L. Narowetz (Rein.), President, Narowetz Heating & Ventilating Co., 1701 Maypole Av.

161-54 James M. Clucas, Architect & Engineer Man, Unistrut Products Co., 1013 W. Washington Blvd.

162-54 G. Leslie Welch, Mid-Western Region Engrg. Manager, Westinghouse Electric Corp., Merchandise Mart.

WSE Personals

Casimir Z. Greenley, MWSE, has been appointed manager of the insurance department of International Minerals & Chemical Corp. He formerly was associated with Montgomery Ward & Co., where he had been manager of Insurance & Loss Prevention. At International, he is in charge of the complete insurance set-up.

* * *

John Slezak, MWSE, president of the Turner Brass Works, has announced that he has resigned as president of that organization and has disposed of his interest in it. The effective date is April 1, 1955. Slezak has announced that he intends to devote more of his time to other interests. His principal interest will be the Kable Brothers Printing Company, located at Mount Morris, Ill. He is chairman of this company. Another principal interest will be the Hazeltine Corporation in New York City. He is a director of this organization.

* * *

H. W. Ufer, MWSE, operating manager of the Griffin Wheel Company in Chicago, was honored recently by his fellow employees for having been a member of the company for over 50 years. E. L. Williams, sales secretary, and F. H. Tout, eastern sales manager, were also honored for their tenure of more than half a century.

* * *

R. D. Merrill, MWSE, has been appointed director of engineering for Stone Container Corporation. He is responsible for design construction and electrical, mechanical, and power engineering for all of the company's corrugated box plants, and paperboard and paper mills. The company now has plants or mills at Pittsburgh and Philadelphia, Pa.; Mansfield, Chillicothe, and Franklin, Ohio; and Mobile, Ala. Headquarters are in Chicago. W. C. Ritchie & Company has recently been taken over by Stone Container Corporation.

* * *

Bernard A. Schroeder, MWSE, was elected president of the Patent Law Association of Chicago at a recent meeting in the Midday Club. The association was founded in 1884 and is the oldest organization in the United States of attorneys who specialize in patent law. Its membership includes over four hundred patent lawyers in the Chicago area.

After graduating from the University of Illinois in mechanical engineering, he obtained his law degree from Chicago Kent College of Law. He has been a member of the Western Society of Engineers since 1933. He is also a member of Union League Club, Westmoreland Country Club, and is a past president of the Chicago Illini Club. He is admitted to practice before the United States Supreme Court, the Illinois Supreme Court, and many of the U. S. District and Court Appeals courts.

Schroeder is a partner in the firm of Schroeder, Hofgren, Brady and Wegner at 20 N. Wacker Drive. The firm was founded in 1876 and now has nine partners and seven associates.

* * *

Irving H. Streicher, MWSE, is now production manager of Grand Sheet Metal Products Company. In this capacity he will be responsible for the production and production control of all divisions. All divisional superintendents will be directly responsible to Streicher. The Grand Sheet Metal Products Company is located in Melrose Park, Ill.

* * *

Dr. Gustav Egloff, MWSE, will attend the Refining Division meeting of the American Petroleum Institute, held from May 9 to 12, in St. Louis, Mo. On Sunday, May 8, he will attend the API Project 44 Advisory Committee meeting of which he is a member.

He will attend the American Institute of Chemists annual meeting, held in Chicago, May 11 to 13. He is a member of the Gold Medal Award Committee and the Honorary Membership Committee—also Council Representative of the Chicago Section of this organization.

On May 14, Dr. Egloff will leave for Caracas, Venezuela to attend the Sixth Latin American Congress of Chemistry. He will be one of four main speakers. The title of his talk will be "Petrochemicals." He will deliver it on May 18.

The meeting at Caracas ends on May 19, and Dr. Egloff leaves on that date for Trinidad, where he will visit refineries, and give a talk (on May 20) before the

Trinidad Section of the Institute of Petroleum of Great Britain. Title of his talk will be "The Modern Oil Industry."

* * *

Leslie G. Janett, MWSE, is now vice-president and manager of the Chicago office of the J. O. Ross Engineering Corporation. The Chicago office covers the mid-section of the United States from Canada to the Gulf of Mexico. It concerns itself with the design, engineering, and manufacture of large industrial air-processing and drying equipment. The home offices of the corporation is in New York City.

* * *

James D. Cunningham, MWSE, president of Republic Flow Meters company, and **Alex D. Bailey,** MWSE, retired Commonwealth Edison company vice president, have been named co-chairmen of the 75th anniversary annual national meeting of the American Society of Mechanical Engineers to be held Nov. 13-18, 1955 in Chicago.

Fifteen hundred mechanical engineers and guests will attend the five-day convention to be held in the Conrad Hilton hotel. The Chicago section of the society will be host to the visitors.

Cunningham and Bailey are former national presidents of ASME and are chairman and vice-chairman, respectively, of the board of trustees of Illinois Institute of Technology.

$45,000,000 — — IIT Half Way There

Development of a $45,000,000 education and research center at Illinois Institute of Technology, Chicago, is approximately 50 per cent completed, Dr. John T. Rettaliata, MWSE, president of IIT, stated April 5.

Illinois Tech's part in a $226,000,000 redevelopment program under way on the city's central south side was described by Rettaliata at a meeting of the South Side Bankers association at the South Side Swedish club.

He pointed out that the Institute's over-all plan calls for the erection of 50 buildings, many of which have been completed. He detailed accomplishments to date as follows:

—Acquisition of more than 90 acres of a planned 110-acre campus, known as Technology Center.

—Completion of 17 new buildings for classrooms, laboratories, and housing.

—Construction in progress on three buildings. Two are student-staff apartment buildings, and the other a classroom building to house the school's department of architecture, its Institute of Design, and a newly-created urban and regional planning department.

—Construction to start this year on four other buildings. They include an electrical engineering and physics building which will house the nation's first nuclear reactor for industrial research, the Allen C. Lewis liberal studies classroom building, and two fraternity houses.

The remaining buildings are expected to be erected during the next 10 to 15 years, the Illinois Tech president added.

He said the Institute has experienced "spectacular" growth since its formation in 1940 by the merger of Armour Institute of Technology and the Lewis Institute. At that time, IIT was housed in a half dozen old buildings situated on seven acres of ground.

"In the 15 years," he added, "capital assets have grown from approximately $5,000,000 to $27,000,000, and the annual operating budget increased from $1,500,000 to more than $16,000,000. Illinois Tech trains more engineering students, in day and evening classes, than any other college or university in the country."

Similar growth has been recorded by Armour Research Foundation, research affiliate of IIT, he declared. The foundation, which started in 1936 with an annual budget of $40,000 and three scientists, currently employs more than 1,100 people, and does an annual research volume of nearly $12,000,000.

He expressed confidence in the successful accomplishment of the Institute's program, adding:

"All of this has been done, and will be done, with private capital, for the advancement of private education. It is a dramatic demonstration of accomplishment by private education, made possible by the cooperation of private business enterprise."

Obituaries

The Western Society of Engineers has recently been notified of the following deaths:

* * *

Frederick W. Dencer, noted as an authority on structural steel, died on February 11, 1955. A member of the Society since 1909, he had been a life member for the last fourteen years. Formerly assistant division engineer with the American Bridge Company, he retired in 1941. Mr. Dencer, who had been president of the Chicago Technical College in 1904 and 1905, was a co-founder of that organization.

* * *

Oscar H. Gosswein, a member of the Western Society of Engineers since 1920, died on January 1, 1955. He had been a life member. From 1944 to 1947 he served as a director of the Bridge and Structural Engineering Section. Until 1952 when he retired, Mr. Gosswein had been technical service manager at Universal Atlas Cement Company in Chicago.

* * *

Egbert M. Tingley, who had served as a member of the Library Committee from 1940 to 1946, died on January 11, 1955. He had joined the Western Society in 1928. Formerly employed by the Commonwealth Edison Company, Mr. Tingley was retired at the time of his death.

* * *

H. G. Armstrong, a member of the Western Society since 1918, died on December 21, 1954. He became a life member in 1949. Mr. Armstrong, until his death, had been a general contractor. Born in Toronto, Ontario, Canada, Mr. Armstrong was made a citizen of the United States by an act of Congress. He received his education by correspondence and by home study.

* * *

Edwin L. Paintin, formerly a special practice engineer at the Illinois Bell Telephone Company, died on January 4, 1955. Mr. Paintin, who became a member of the Western Society in 1946, had been a member of the Communication and Electrical sections.

Index of MIDWEST ENGINEER *Advertisers*

Help the Society help you!

Keep it posted on changes in your status

To make sure we have you listed correctly, if you change your status

MAIL FORM TO THE WESTERN SOCIETY OF ENGINEERS
84 E. Randolph St., Chicago 1, Ill.

Name:..........

Position:..........

Firm:..........

Firm Address:..........

Home Address:..........

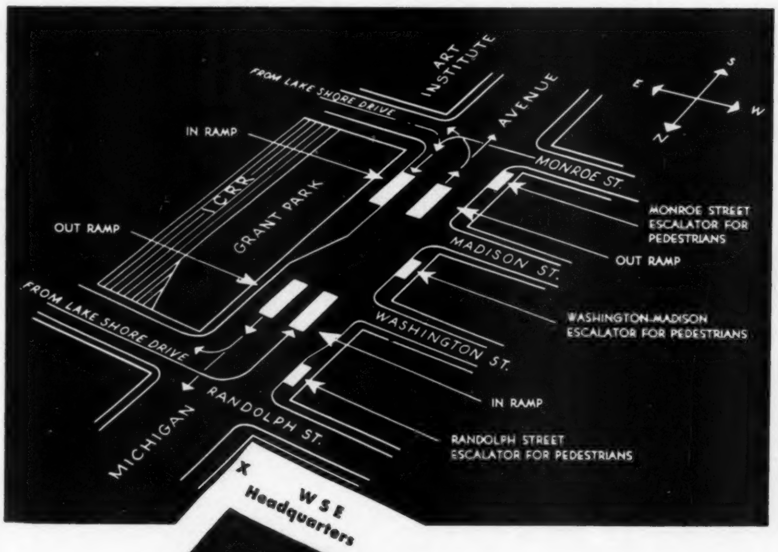
Home Phone:.......... **Business Phone:**..........

SAY, ENGINEER!

Do you like to DRIVE?

Then why not drive to WSE meetings and other functions? There's plenty of PARKING almost at the door—the Underground Garage is diagonally across the street from WSE Headquarters (see the map below) and two private garages are a block west.

Below: map showing Park Department Underground Garage



Interior view of Underground Garage

If you're not driving it's still convenient to get to and from WSE meetings.

Here are handy stations or stops:

- The Cab Stand is just across the street
- The Elevated is one block west
- The Subway is two blocks west
- Buses stop at the door or within a few blocks for every part of town
- The IC Suburban station is across the street
- Other suburban stations are conveniently served by bus or elevated.

You see, your WSE Headquarters is at the handiest place in Chicago.

ENTER at either Monroe or Randolph Street on Michigan

EASY access, Speedy exit

ESCALATORS convey you to street level

CAPACITY The garage with its 2359 parking spaces, is designed to prevent overcrowding.

stanta